# UNITED STATES PATENT AND TRADEMARK OFFICE

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| 10/665,145 | 09/22/2003 | Toshihiro Usa | Q77572 | 5795 |

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| EXAMINER |
|---|
| YOUNG, CHRISTOPHER G |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1756 | |

DATE MAILED: 03/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 10/665,145 | USA ET AL. |
| | **Examiner** | **Art Unit** | |
| | Christopher G. Young | 1756 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)☒ Responsive to communication(s) filed on *22 September 2003*.

2a)☐ This action is **FINAL**.    2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All  b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1 sheet*.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

## DETAILED ACTION

### *Priority*

1.    Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers

have been placed of record in the file.

### *Information Disclosure Statement*

2.    The information disclosure statement (IDS) has been considered by the examiner.

### *Claim Rejections - 35 USC § 102*

3.    The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section
122(b), by another filed in the United States before the invention by the applicant for
patent or (2) a patent granted on an application for patent by another filed in the United
States before the invention by the applicant for patent, except that an international
application filed under the treaty defined in section 351(a) shall have the effects for
purposes of this subsection of an application filed in the United States only if the
international application designated the United States and was published under Article
21(2) of such treaty in the English language.

4.    Claims 1-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Tomita, US

Patent Application Publication 2004/0240366.

The instant application is drawn to an electron beam lithography method for performing

lithography of elements included in a pattern by scanning a disk having resist coated thereon,

placed on a rotating stage which is movable in a radial direction of the disk, with an electron

beam while rotating the rotating stage, comprising the steps of: performing scanning of the electron beam so as to fill in an element shape by oscillating the electron beam having a beam diameter smaller than a minimum width of the element shape in a direction intersecting the circumferential direction while rotating the disk unidirectionally.

Tomita teaches a recording disc capable of recording a recording mark in a reproduction control data area of a recording disc for authoring. In the recording disc, a disc address indicating a position on the disc is recorded at a constant linear velocity in advance and has an information data area where a recording mark string carrying information data is recorded. Further, this recording disc includes a reproduction control data area where a disc address is recorded at a constant angular velocity in advance and recording marks in the recording mark string carrying the reproduction control data are to be recorded in the direction orthogonal to a plurality of adjacent tracks.

Referring to FIG. 3, schematically illustrated is an apparatus for fabricating a master disc, which is later used to fabricate recording discs for authoring, according to an embodiment of the present invention.

A master disc 15 has a resist layer formed on its upper surface. A spindle motor 17 rotates the master disc 15 at a constant angular velocity or a constant linear velocity. A feed stage 18 moves the master disc 15 and spindle motor 15 in a radial direction of the master disc 15. An electron beam device 10 irradiates an electron beam to the surface of the resist layer of the master disc 15. A controller 25 controls the electron beam device 10, spindle motor 17 and feed stage 18 in a manner described below.

First, the controller 25 generates a wobble signal having a fixed amplitude. The wobble

signal has a waveform that corresponds to a disc address, which indicates a position on the disc.

For example, if one bit of the disc address indicates a logic level 1, the controller 25 generates a

wobble signal having a waveform shown in FIG. 4A in a predetermined period T. If one bit of

the disc address indicates a logic level 0, the controller 25 generates a wobble signal having a

waveform shown in FIG. 4B in the predetermined period T. Then, the controller 25 controls

(operates) the electron beam device 10 in order to oscillate the axis of the electron beam in the

disc radial direction based on the wobble signal. As a result, the electron beam device 10

irradiates the electron beam on the resist layer of the master disc 15 while the electron beam axis

is oscillating in the disc radial direction in accordance with the wobble signal of FIG. 4A or 4B.

During this operation, the controller 25 controls the feed stage 18 such that the electron beam

irradiation position on the resist layer surface gradually moves from the inside of the disc toward

the outside of the disc.

The controller 25 causes the spindle motor 17 to rotate such that a relative moving speed

between a spot formed at a position of irradiation of the electron beam and the master disc

surface is constant (fixed linear velocity) while the electron beam is being irradiated to those

portions of the resist layer surface which correspond to the lead-in area 2 and information data

area 1 shown in FIG. 1.

On the other hand, the controller 25 causes the spindle motor 17 to rotate such that the

master disc 15 rotates at a constant angular velocity while the electron beam is being irradiated to

those portions of the resist layer surface, which correspond to the PEP area 4 shown in FIG. 1.

Additionally, the PLL circuit 76 generates a clock signal CK having a predetermined

frequency which is phase-synchronized with the wobble signal WOB, and supplies the clock

signal to a recordation signal processing circuit 79. The disc address extraction circuit 77 uses

the waveform of the wobble signal WOB, as shown in FIG. 4A or 4B, to extract the address on

the recording disc 73 (disc address) currently traced by the recordation/reproduction head 71.

The disc address extraction circuit 77 then supplies a disc address signal AD, which indicates the

disc address, to the recordation signal processing circuit 79. The rotation speed controlling

circuit 78 generates a rotation speed signal RV that specifies (determines) an appropriate rotation

speed to cause the frequency of the wobble signal WOB to match a predetermined reference

frequency. The rotation speed control circuit 78 supplies the rotation speed signal RV to the

spindle motor 72.

When the recordation signal processing circuit 79 records information data in the

information data area 11 of the recording disc 73, the recordation signal processing circuit 79

first performs a predetermined modulation process to the information data to obtain a modulated

information signal. The recordation signal processing circuit 79 then supplies the modulated

information signal to the recordation/reproduction head 71 based on the disc address signal AD

at a timing decided by the clock signal CK. The recordation/reproduction head 71 generates a

recordation beam having an optical power, which corresponds to the modulated information

signal, and irradiates the recordation beam on the land track LT in the information data area 11.

Since the land track LT is formed at the constant linear velocity in the information data area 11,

the spindle motor 72 causes the recording disc 73 to rotate such that the relative movement speed

between the beam spot of the recordation beam and the surface of the recordation disc 73

becomes a constant value. By the above-described operation, a string of recordation marks,

which correspond to the modulated information signal, is recorded on the land track LT in the

information data area 11 of the recordation disc 73 at a constant linear velocity.

Based on this, claims 1-25 are anticipated.

5.      Claims 1-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Wada, US Patent

Application Publication 2002/0172130.

The instant application is drawn to an electron beam lithography method for performing

lithography of elements included in a pattern by scanning a disk having resist coated thereon,

placed on a rotating stage which is movable in a radial direction of the disk, with an electron

beam while rotating the rotating stage, comprising the steps of: performing scanning of the

electron beam so as to fill in an element shape by oscillating the electron beam having a beam

diameter smaller than a minimum width of the element shape in a direction intersecting the

circumferential direction while rotating the disk unidirectionally.

The prior art reference provides us with a description in reference to FIGS. 3A to 3C with

regard to how to move the beam spot, provided that the positions of the walls of the groove G are

fixed in the radial direction of the optical disk DK and that an overlapping area is provided for

one scan each. FIG. 3A shows how the beam spot moves to form the groove G in the optical

disk DK, and FIGS. 3B and 3C show a change in the position of the beam spot on the optical

disk DK, which occurs during the formation of the groove G.

In the above-mentioned example shown in FIGS. 2A to 2C, an overlapping area is not

provided for one scan each, and therefore, each of the walls OUT and IN of the groove G formed

as shown in FIG. 2A has a shape formed of a series of arcs of circles each corresponding to the

shape of the beam spot BS, so that this causes changes in the shapes of the walls OUT and IN

and thus leads to a drop in the signal-to-noise ratio of recorded information under reproduction.

In an example shown in FIGS. 3A to 3C, the number of overwrite operations per unit length in

the X-direction is therefore set to N (in other words, N scans take place per unit length in the X-

direction) in order to form the groove G having the smoothest possible walls OUT and IN.

More specifically, as shown in FIG. 3A, the above-mentioned dose of electrons must be

always fixed at the same value as the value of the dose of electrons of the example shown in FIG.

2A in order to form the groove G having a uniform width W through the scanning of the beam

spot BS under the assumption that the optical disk DK does not rotate as in the case of the

example shown in FIG. 2A, and therefore it is necessary to repeat the following scanning: the

scanning of the beam spot BS at a constant linear velocity $V.sub.Y = NV.sub.0$ in the Y-direction;

and the scanning of the beam spot BS at the same linear velocity $V.sub.Y$ in the direction

opposite to the direction of the immediately preceding scanning after moving the beam spot BS

in the X-direction by the diameter d divided by the number N of overwrite operations after the

end of the scanning by the width W.

As in the case of the example shown in FIG. 2B, the description is then given with

reference to FIG. 3B with regard to a change in the position of the beam spot BS on the optical

disk DK with respect to time, which is caused by the movement of the beam spot BS shown in

FIG. 3A (under the assumption that the optical disk DK does not rotate). A change in position in

the Y-direction assumes a triangular waveform due to the above-mentioned movement of the

beam spot BS in the Y-direction, as shown in an upper graph of FIG. 3B.  The amplitude of the

wave is fixed at the value W, and the slope thereof is fixed at the linear velocity NV.sub.0.

Therefore, when the linear velocity V.sub.0 and the diameter d of the beam spot BS are

previously determined, control (i.e., modulation) of the product f.times..delta. according to

information to be carried on the walls OUT and IN allows changing the width of the groove G,

that is, the positions of the walls OUT and IN in the radial direction, according to information to

be carried on the groove G, while keeping the dose of electrons constant, and incidentally, f

denotes a frequency for the scanning of the beam spot BS (hereinafter, the frequency is

appropriately referred to as a wobble frequency), and .delta. denotes a step width in the X-

direction.  In other words, when the groove G is formed keeping the product f.times..delta.

fixed, this makes a difference in the dose of electrons between wide and narrow portions of the

groove G.

The above equation (12) indicates that the above-described modulation of the product

f.times..delta. according to information to be carried on the walls OUT and IN is equivalent to

modulation of the linear velocity V.sub.L of the optical disk DK according to the information.

Accordingly, modulating the width W of the groove G according to information to be

carried on the groove G, while keeping the dose of electrons constant can be accomplished by

changing the wobble frequency f or the step width .delta. in inverse proportion to the width W.

Consequently, a change in either of the wobble frequency f and the step width .delta. can be

accomplished by controlling the linear velocity V.sub.L of the optical disk DK in itself.  In actual

fact, if low frequency components of a signal corresponding to information to be recorded

through changes in the positions of the walls OUT and IN in the radial direction are small in
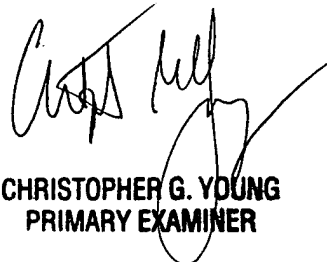
magnitude, the position of the beam spot BS in the X-direction is controlled as shown in FIG. 2C

or 3C by using the above-mentioned linear velocity V.sub.L as its average value and keeping the

linear velocity V.sub.L constant, and thus, this control can obtain the result equivalent to the

result of the above-described control of the linear velocity V.sub.L.

Also refer to claims 8-14 of the Publication.


6.      Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Christopher G. Young whose telephone number is 571-272-1394.

The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mark Huff can be reached on 571-272-1385.  The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system.  Status information for published applications

may be obtained from either Private PAIR or Public PAIR.  Status information for unpublished

applications is available through Private PAIR only.  For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


CHRISTOPHER G. YOUNG
PRIMARY EXAMINER